PATENT ABSTRACTS OF JAPAN

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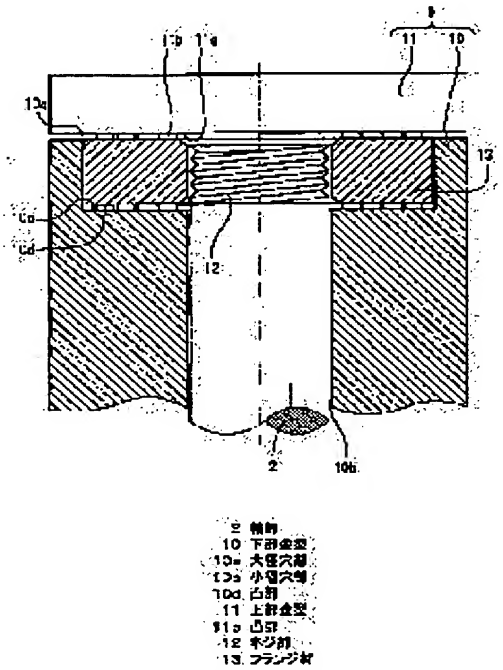
(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD
(72)Inventor : IWATA SEIICHI

(54) DYNAMIC PRESSURE TYPE THRUST BEARING DEVICE AND ITS MANUFACTURING METHOD AND DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To manufacture a highly reliable and well precise dynamic pressure type thrust bearing in less machining stages.
SOLUTION: A flange material 13 is fitted into a shaft portion 2 at one end of which a threaded portion 12 is formed to be joined to a thrust flange, and a dynamic pressure generating groove is formed in the flange material 13 using a forming die 9 for a press machine and at the same time the flange material 13 is joined to the shaft portion 2.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] It is arranged free [rotation inside the sleeve blockaded with the thrust plate of the direction where an axis with a thrust flange meets the end section of a shank at said thrust flange]. It is contrary to one side face of said thrust flange and it which counter said thrust plate, and also at least to one side of a side face It faces manufacturing the dynamic pressure mold thrust bearing equipment with which the dynamic pressure generating slot which makes the fluid with which it fills up between said axes and sleeves generate dynamic pressure was formed. While making the shank by which concave heights were formed in the periphery of the end section insert in the minor diameter hole formed in lower metal mold By extrapolating circular ring tabular flange material in the end section of said shank, laying in the end face of the lower metal mold of a direction which crosses the axial center of said minor diameter hole, pressing this flange material in the direction of board thickness, and carrying out plastic deformation between up metal mold While forming said dynamic pressure generating slot by the heights formed at said lower metal mold or up metal mold of said flange material which counters the side face decided beforehand The manufacture approach of the dynamic pressure mold thrust bearing equipment which is made to carry out fitting of the inner circumference of said flange material to the concave heights of said shank, and is characterized by creating an axis with said thrust flange in the end section of a shank.
[Claim 2] The manufacture approach of the dynamic pressure mold thrust bearing equipment according to claim 1 characterized by restraining the periphery of flange material to lower metal mold or up metal mold by the inner skin of a minor diameter hole and the major-diameter hole formed in the shape of the same axle.
[Claim 3] It is the manufacture approach of the dynamic pressure mold thrust bearing equipment according to claim 1 characterized by for the shank having had the outer-diameter dimension which forms a 1 micrometer - 3 micrometers gap within a minor diameter hole, and flange material having the inside diameter which forms a 10 micrometers - 50 micrometers gap to the concave heights of a shank.
[Claim 4] The manufacture approach of the dynamic pressure mold thrust bearing equipment according to claim 1 characterized by being the screw section by which the screw cutter was carried out in the direction of tightness to the direction of running torque by the body of revolution which the concave heights of a shank become from the sleeve relatively rotated to this shank, and a thrust plate.
[Claim 5] The screw section of a shank is the manufacture approach of the dynamic pressure mold thrust bearing equipment according to claim 4 characterized by having the direction die length of an axial center shorter than the board thickness of the flange plate after plastic deformation.
[Claim 6] The lower metal mold with which the minor diameter hole which is the metallic ornaments used for manufacture of the axis of the dynamic pressure mold thrust bearing equipment indicated by claim 1, and a shank inserts, and the major-diameter hole which circular ring tabular flange material inserts were formed in the shape of the same axle, Said flange material which was extrapolated by the end section of said shank exposed in said major-

diameter hole, and was inserted in said major-diameter hole is consisted of up metal mold compressible in the plate pressure direction. Metal mold with which the convex type which ****s in the opposed face of said lower metal mold which counters the side face in which said flange material was decided beforehand, or up metal mold in said dynamic pressure generating slot was formed.

[Claim 7] The punching metal mold which pierces flange material from the plate which is the dynamic pressure mold thrust bearing equipment manufacturing installation used for manufacture of the axis of the dynamic pressure mold thrust bearing equipment indicated by claim 1, and is sent in the fixed direction, A press-working-of-sheet-metal machine with the die builder implement which combined the compression metal mold according to claim 9 which restrains and compresses said flange material on the lower stream of a river of this punching metal mold, A shank supply means to supply the shank by which concave heights were formed in the periphery of the end section to the compression metal mold of said press-working-of-sheet-metal machine, The dynamic pressure mold thrust bearing equipment manufacturing installation equipped with a workpiece taking-out means to take out the axis with which it comes to unite a shank with said flange material by compression processing in the compression metal mold of said press-working-of-sheet-metal machine.

[Claim 8] It is arranged free [rotation inside the sleeve blockaded with the thrust plate of the direction where an axis with a thrust flange meets the end section of a shank at said thrust flange]. It is contrary to one side face of said thrust flange and it which counter said thrust plate, and also at least to one side of a side face It is dynamic pressure mold thrust bearing equipment with which the dynamic pressure generating slot which makes the fluid with which it fills up between said axes and sleeves generate dynamic pressure was formed. It is dynamic pressure mold thrust bearing equipment characterized by for the shank of said axis having had concave heights on the periphery of the end section, and having deformed the thrust flange of said axis plastically by press working of sheet metal, having fixed in the hole of inner circumference to the concave heights of said shank, and forming said dynamic pressure generating slot.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the dynamic pressure mold thrust bearing equipment which constitutes the fluid bearing equipment used for a small motor etc., its manufacture approach, and a manufacturing installation.
[0002]
[Description of the Prior Art] Conventionally, the spindle motor which used fluid bearing equipment is used for information machines and equipment, such as a magnetic-disk driving gear. As the dynamic pressure mold thrust bearing equipment which constitutes fluid bearing equipment is shown in drawing 11 , it is arranged free [rotation inside the sleeve 5 blockaded with the thrust plate 4 of the direction where the axis 3 which the thrust flange 1 fixed in the end section of a shank 2 meets said thrust flange 1], and the gap of said shank 2 and sleeve 5 and the gap of the thrust flange 1 and a thrust plate 4 are filled up with the fluids 6, such as a lubricating oil. The groove 7 for dynamic pressure generating which had the bending section as shown in drawing 12 in the thrust flange 1 and one [at least] opposed face of a thrust plate 4 is formed.
[0003] And by setting a fixed shaft as the axis 3 which consists of a thrust flange 1 and a shank 2 by that cause, and rotating body of revolution by using a thrust plate 4 and a sleeve 5 as body of revolution, a fluid is brought together in the bending section of the groove 7 for dynamic pressure generating, and dynamic pressure is generated, and it is constituted so that body of revolution may be maintained in the surfacing condition (non-contact condition) from a fixed shaft. However, the configuration which uses a thrust plate 4 and a sleeve 5 as a fixed object, and uses the thrust flange 1 and a shank 2 as body of revolution is also possible.
[0004] In addition, although the shank 2 and the thrust flange 1 have been concluded on the screw 8 in the illustrated axis 3 since it corresponds to the thrust to the thrust flange 1 generated during rotation of body of revolution, the technique of shaping etc. may welding and really be taken. Generally the groove 7 for dynamic pressure generating is made into the configuration which put in a row two or more slots of a configuration similar to an others and U character mold, a spiral mold, or them. [mold / which was illustrated / V character]
[0005]
[Problem(s) to be Solved by the Invention] By the way, the dynamic pressure generated in case body of revolution which was described above is rotated, i.e., the flying height, changes with the slot number of the groove 7 for dynamic pressure generating, an include angle, width of face, die length, the depth, flatness of each slot, etc., and it changes with the squareness of the shank after an assembly, and a thrust flange, the relative rotational frequency of body of revolution and a fixed object, or viscosity of a gap and the fluid with which it fills up between body of revolution and a fixed object further. That is, the flying height generated through a fluid is greatly influenced by the thrust flange 1, a shank 2, a thrust plate 4, and the configurations and precision of a sleeve 5.
[0006] Therefore, in order to be stabilized and to obtain the flying height, at an axis 3 side, the configuration precision of the thrust flange 1, the configuration precision of the groove 7 for

dynamic pressure generating, the outer-diameter precision of a shank 2, the squareness after the assembly of a shank 2 and the thrust flange 1, etc. must be secured with high degree of accuracy. and -- therefore, about the thrust flange 1, recessing and double-sided polish processing by etching processing etc. are indispensable, screw **** for concluding the thrust flange 1, the end-face polish for squareness reservation, etc. are indispensable about a shank 2, and the present condition is having required much a processing process and processing cost.
[0007] Though this invention solves the above-mentioned problem and a processing process is reduced, it is reliable and aims at offering accurate dynamic pressure mold thrust bearing equipment.
[0008]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention inserts a thrust flange material in the shank which formed the concave heights for thrust flange junction in the end. In a press-working-of-sheet-metal machine It is what was made to join a thrust flange material to a shank (unification), and it becomes possible to manufacture the accurate axis with which the squareness of the thrust flange and shank which were assembled and carried out was also secured by 1 press working of sheet metal at the same time it forms a dynamic pressure generating slot in said thrust flange material.
[0009] Namely, an axis with a thrust flange this invention according to claim 1 in the end section of a shank It is arranged free [rotation inside the sleeve blockaded with the thrust plate of a direction which meets said thrust flange]. It is contrary to one side face of said thrust flange and it which counter said thrust plate, and also at least to one side of a side face It faces manufacturing the dynamic pressure mold thrust bearing equipment with which the dynamic pressure generating slot which makes the fluid with which it fills up between said axes and sleeves generate dynamic pressure was formed. While making the shank by which concave heights were formed in the periphery of the end section insert in the minor diameter hole formed in lower metal mold By extrapolating circular ring tabular flange material in the end section of said shank, laying in the end face of the lower metal mold of a direction which crosses the axial center of said minor diameter hole, pressing this flange material in the direction of board thickness, and carrying out plastic deformation between up metal mold While forming said dynamic pressure generating slot by the heights formed at said lower metal mold or up metal mold of said flange material which counters the side face decided beforehand Fitting of the inner circumference of said flange material is carried out to the concave heights of said shank, and it is characterized by creating an axis with said thrust flange in the end section of a shank.
[0010] According to this manufacture approach, formation of a dynamic pressure generating slot, and the junction between flange material and a shank and reservation of squareness can be attained to coincidence at one process of press working of sheet metal. Moreover, even if it uses the flange material which does not perform pre-processing of cutting, grinding, etc., the precision of the flatness and parallelism of both sides of a thrust flange is securable. Therefore, processes, such as end-face polish of the shank for securing the squareness after conclusion processes, such as the process and screw stop which form the tap hole, screw hole, etc. for concluding the flange material and shank like before, and welding, and an assembly, and the process which forms a dynamic pressure generating slot in flange material beforehand, or is ground are not needed, but a routing counter can be reduced.
[0011] This invention according to claim 2 is characterized by restraining the periphery of flange material to lower metal mold or up metal mold by the inner skin of a minor diameter hole and the major-diameter hole formed in the shape of the same axle in the manufacture approach of dynamic pressure mold thrust bearing equipment according to claim 1.
[0012] By this, in case flange material is compressed in the direction of board thickness, it becomes easy to make it flow in the direction of an axial center so that a periphery may fit into the concave heights of a shank, and management of the outer diameter of flange material (therefore, thrust SURANJI) also becomes easy.
[0013] This invention according to claim 3 has the outer-diameter dimension in which a shank forms a 1 micrometer - 3 micrometers gap within a minor diameter hole in the manufacture approach of dynamic pressure mold thrust bearing equipment according to claim 1, and flange

material is characterized by having the inside diameter which forms a 10 micrometers – 50 micrometers gap to the concave heights of a shank.
[0014] it is possible to secure the conventional screw stop, an EQC or the stripping force-proof beyond it and the running torque-proof force, and rigidity as an assembly article by this, while highly precise squareness is securable from the physical relationship of a shank, flange material, and lower metal mold between a shank and flange material (therefore, thrust flange) at the time of an assembly (therefore — to assemble — after).
[0015] This invention according to claim 4 is characterized by being the screw section by which the screw cutter was carried out in the direction of tightness to the direction of running torque by the body of revolution which the concave heights of a shank become from the sleeve relatively rotated to this shank, and a thrust plate in the manufacture approach of dynamic pressure mold thrust bearing equipment according to claim 1.
[0016] It is possible to secure said stripping force-proof sufficient between a shank and flange material (therefore, thrust flange) and the running torque-proof force with the configuration of a screw with workability high as a configuration which can heighten stripping force-proof and the running torque-proof force, and to secure the rigidity as an assembly article by this. What is necessary is just to choose the torsion include angle of a screw thread from the parallel (90 degrees) from a right angle (0 degree) to the axial center of a shank in consideration of required stripping force-proof and especially the running torque-proof force. As required stripping force-proof and the running torque-proof force are acquired, an outer diameter may be a uniform configuration that what is necessary is just to set up suitably, and the configuration of the screw section may also be a configuration where the outer diameter changed in the direction of an axial center of a shank. Moreover, the center section in the direction in alignment with the axial center of a shank may set up the pitch of a screw thread small, and the configuration of the screw thread in the cross section which passes along the axial center of a shank may set up so that a triangle, a square, a trapezoid, a hemicycle, or **** tooth form may be made.
[0017] This invention according to claim 5 is characterized by the screw section of a shank having the direction die length of an axial center shorter than the board thickness of the flange plate after plastic deformation in the manufacture approach of dynamic pressure mold thrust bearing equipment according to claim 4.
[0018] By this, the screw thread of termination stops, a use is demonstrated and more sufficient stripping force-proof and the running torque-proof force, and rigidity can be secured. The lower metal mold with which the minor diameter hole which this invention according to claim 6 is metallic ornaments used for manufacture of the axis of the dynamic pressure mold thrust bearing equipment indicated by claim 1, and a shank inserts, and the major-diameter hole which circular ring tabular flange material inserts were formed in the shape of the same axle, Said flange material which was extrapolated by the end section of said shank exposed in said major-diameter hole, and was inserted in said major-diameter hole is consisted of up metal mold compressible in the plate pressure direction. It is characterized by forming the convex type which ****s in the opposed face of said lower metal mold which counters the side face in which said flange material was decided beforehand, or up metal mold in said dynamic pressure generating slot.
[0019] According to this metal mold, when flange material sets the major-diameter hole of lower metal mold as the moderate gap and the inside diameter preferably inserted with a 10 micrometers – 30 micrometers gap, in case it becomes possible to extrapolate flange material easily to a shank and a flange plate is compressed in the direction of board thickness, it becomes possible to restrain an appearance by this major-diameter hole, and to make it mainly flow in the direction of an axial center. Therefore, it becomes easy the thing of flange material and a shank for which it inserts in and **** is automated, and to manage the outer diameter of flange material (therefore, thrust SURANJI) at the time of press working of sheet metal.
[0020] The punching metal mold which pierces flange material from the plate which this invention according to claim 7 is a dynamic pressure mold thrust bearing equipment manufacturing installation used for manufacture of the axis of the dynamic pressure mold thrust bearing equipment indicated by claim 1, and is sent in the fixed direction, A press-working-of-sheet-

metal machine with the die builder implement which combined the compression metal mold according to claim 9 which restrains and compresses said flange material on the lower stream of a river of this punching metal mold, It is characterized by having a shank supply means to supply the shank by which concave heights were formed in the periphery of the end section, and a workpiece taking-out means to take out the axis with which it comes to unite a shank with said flange material by compression processing in the compression metal mold of said press-working-of-sheet-metal machine, to the compression metal mold of said press-working-of-sheet-metal machine.

[0021] According to this equipment, compound processing of unifying a shank to the flange material pierced previously within the single metal mold of a press-working-of-sheet-metal machine at the same time it pierces flange material can be performed, and the above-mentioned axis can be completed. Therefore, large process compaction is realizable.

[0022] An axis with a thrust flange this invention according to claim 8 in the end section of a shank It is arranged free [rotation inside the sleeve blockaded with the thrust plate of a direction which meets said thrust flange]. It is contrary to one side face of said thrust flange and it which counter said thrust plate, and also at least to one side of a side face It is dynamic pressure mold thrust bearing equipment with which the dynamic pressure generating slot which makes the fluid with which it fills up between said axes and sleeves generate dynamic pressure was formed. It is characterized by for the shank of said axis having had concave heights on the periphery of the end section, and having deformed the thrust flange of said axis plastically by press working of sheet metal, having fixed in the hole of inner circumference to the concave heights of said shank, and forming said dynamic pressure generating slot.

[0023]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained using a drawing. Since the dynamic pressure mold thrust bearing equipment in the operation gestalt of this invention has the almost same configuration as the conventional dynamic pressure mold thrust bearing equipment previously explained using drawing 11 and drawing 12 , it omits the whole illustration, and attaches and explains the same sign as drawing 11 and drawing 12 about the axis 3 which is a peculiar configuration member.

[0024] In drawing 1 , 9 is a die builder implement and consists of lower metal mold 10 and up metal mold 11. The lower metal mold 10 is a tube-like object with which major-diameter hole 10a and minor diameter hole 10b have been arranged in the shape of the same axle, and 10d of heights which **** in the configuration of the dynamic pressure generating slot which it is going to form in back end side 10c which attended major-diameter hole 10a is formed. Heights 11b to which the up metal mold 11 ****s in the configuration of the dynamic pressure generating slot which it is going to form in inferior-surface-of-tongue 11a which the magnitude which can cover major-diameter hole 10a is a plate mostly, and counters major-diameter hole 10a is formed.

[0025] While making the other end of the shank 2 by which the screw section 12 was formed in minor diameter hole 10b of the lower metal mold 10 at the periphery of the end section insert on the occasion of manufacture of an axis 3, the circular ring tabular flange material 13 is made to insert in major-diameter hole 10a of the lower metal mold 10, and it extrapolates in the end section of said shank 2. Subsequently, compression processing of the flange material 13 is carried out to predetermined board thickness by turning and moving the up metal mold 11 to the lower metal mold 10.

[0026] thus, while the heights 10d and 11b which the lower metal mold 10 and the up metal mold 11 resembled the both-sides side of the flange material 13 compressed by carrying out, respectively, and were formed in it invade, the flange material 13 ******s to the method of inside, and the method of outside in accordance with radial, and the inner circumference of the flange material 13 fits into the screw thread of the screw section 12 of a shank 2.

[0027] If the up metal mold 11 and the lower metal mold 10 are removed, the axis 3 with which the thrust flange 1 in which the dynamic pressure generating slot 7 as shown in drawing 2 was formed was united with the end section of a shank 2, and the flatness and parallelism of both sides of the thrust flange 1 were secured will be obtained.

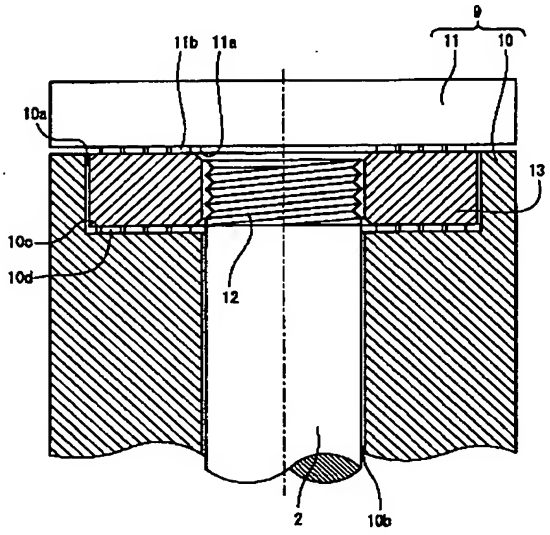
[0028] That is, only by 1 press working of sheet metal, it forms the dynamic pressure generating

slot 7 in the thrust flange 1, and a conclusion condition equivalent to the conventional bis-stop article is not only securable, but can secure flatness and parallelism to it.
[0029] therefore, as compared with the conventional bis-stop method of construction the process and conclusion process which form a tap hole, a screw hole, etc. for conclusion are not only unnecessary, but In order to secure etching processing of a dynamic pressure generating slot, polish processing of both sides of the flange material 13 before it, and the squareness after an assembly, Moreover, polish processing of the end face of a shank 2 for securing the flatness and parallelism of both sides of a flange 1 and both sides of the thrust flange 1 can be omitted, and a steep baton rise and cost reduction are possible.
[0030] In addition, drawing 3 (a) The bore of minor diameter hole 10b holding a shank 2 of the lower metal mold 10 is set as the bore which forms the 1 micrometer - 3 micrometers gap L1 to a shank 2 at the time of a set so that it may be shown. Moreover, the bore of the flange material 13 is set as the bore which forms the 10 micrometers - 50 micrometers gap L2 to the screw section 12 at the time of a set. This is useful although the squareness of a shank 2 and the thrust flange 1 is secured after a press.
[0031] Moreover, the bore of major-diameter hole 10a holding the thrust flange 1 of the lower metal mold 10 So that an appearance may be restrained at the time of compression, and the flange material 13 extrapolated by the shank 2 may flow in the direction of an axial center and may be joined to a shank 2, in order to make easy extrapolation of the flange material 13 to a shank 2 at the time of a set and It is set as the bore which forms the 10 micrometers - 30 micrometers gap L3 to the flange material 13 at the time of a set. Thus, by setting up, the automation of suiting with the flange material 13 and a shank 2 to insert in becomes easy, and outer-diameter management of thrust SURANJI 1 after a press also becomes easy. Drawing 3 (b) The condition after a press is shown.
[0032] In addition, with the above-mentioned gestalt of operation, although the screw section 12 was formed in the end section of a shank 2, if only it can secure sufficient stripping force-proof for a shank 2 and the thrust flange 1, and the running torque-proof force after a press and can secure the rigidity as an assembly article, it is not limited to a screw configuration but a proper crevice and heights may be formed in plurality.
[0033] When considering as the screw section 12 which was described above, as shown in drawing 4, the direction of torsion of screw thread 12a When body of revolution (a thrust plate 4 and sleeve 5) rotates relatively and surfaces to an axis 3 (the thrust flange 1 and shank 2) It is set up so that it may become the direction of tightness to the direction of two energy called the component of a force to the hand of cut of the thrust from inner side 5a of the running torque concerning the thrust flange 1, and the major-diameter hole of a sleeve 5.
[0034] Moreover, as shown in drawing 5 , the torsion include angle alpha of screw thread 12a is chosen by the right angle (0 degree) from parallel (90 degrees) to the axial center of a shank 2 so that the rigidity as sufficient stripping force-proof and the sufficient running torque-proof force, and an assembly article can be secured in the relative relation between the thrust flange 1 and a shank 2.
[0035] Moreover, as shown in drawing 6 , the die length of the screw section 12 in the direction of an axial center of a shank 2 is set up so that only the suitable die length L4 may become short to the board thickness of the thrust flange 1 after a press. When the running torque from body of revolution acts on the thrust flange 1, while screw thread 12a of termination stops, taking effect and being able to secure more sufficient stripping force-proof and the running torque-proof force in the relative relation between the thrust flange 1 and a shank 2 by this, the rigidity as an assembly article is securable.
[0036] As shown in drawing 7 , an outer diameter may be a uniform configuration and the screw section 12 may be a configuration from which an outer diameter changes. for example, (a) almost -- a column and (b) A back taper configuration and (c) A forward tapered shape configuration and (d) An inside low configuration (hard drum form) and (e) the crown -- the shape of a configuration (abacus pellet form) and a (f) wave (gourd form) etc. is possible.
[0037] As shown in drawing 8 , the screw section 12 may set up a pitch small as it approaches a center section from the edge of a direction in alignment with the axial center of a shank 2. As

shown in drawing 9 , the cross section of screw thread 12a may form the screw section 12 so that the shape of the shape of the shape of the shape of a triangle and a square, a trapezoid configuration, and a hemicycle and **** tooth form etc. may be made.
[0038] Drawing 10 shows the production line of the axis 3 which was described above, and the press-working-of-sheet-metal process described above to the production process of the flange material 13 is incorporated. Namely, a plate 14 (charge of a press coil strip) is sent out in the fixed direction fixed distance every to a press-working-of-sheet-metal machine (the whole illustration is omitted). It has the metal mold 15 which combined with the press-working-of-sheet-metal machine compression metal mold 15c equivalent to having described [which carries out compression processing of the flange material 13 which pierced the central hole and appearance of the flange material 13 on the lower stream of a river of the punching metal mold 15a and 15b pierced, respectively and such punching metal mold 15a and 15b, and was completed from the plate 14] above. Near the metal mold 15, a shank supply means 16 to supply the above-mentioned shank 2 processed by cutting, the grinding process, press working of sheet metal, etc., and a workpiece taking-out means 17 to take out the workpiece by which compression processing was carried out by compression metal mold 15c are installed to compression metal mold 15c.
[0039] In this configuration, from the plate 14 sent out in the fixed direction fixed distance every, the main hole for the flange material 13 and the appearance for a flange 13 stand in a row, mold omission is carried out and an axis 3 is assembled with one press from the flange material 13 mold-omission-completed to coincidence, and the shank 2 supplied from the shank supply means 16. The assembled axis 3 is taken out out of a production line by the taking-out means 17.
[0040] Conventionally therefore, about the thrust flange 1 Processing processes by double-sided polish, etching processing, etc., such as recessing and tap hole processing, are indispensable. About a shank 2 What has indispensable screw **** process and bis-stop process for conclusion, and the indispensable processing processes, such as an end-face polish process, is completed in 1 press process and single metal mold with the above-mentioned production line also including mold omission of the flange material 13. Therefore, compared with the former, a manufacture baton and a manufacturing cost are sharply reducible.
[0041]
[Effect of the Invention] As mentioned above, reducing a routing counter conventionally by having joined flange material to the shank at the same time it forms a dynamic pressure generating slot in flange material, according to this invention, by inserting in and carrying out press working of sheet metal of the flange material to a shank, it becomes possible to manufacture dynamic pressure mold thrust bearing equipment equipped with the accurate reliable axis and the coaxial object, and an ultimate cost cut can also be realized.

[Translation done.]

Drawing selection Representative drawing



2 軸部
10 下部金型
10a 大径穴部
10b 小径穴部
10d 凸部
11 上部金型
11b 凸部
12 ネジ部
13 フランジ材

[Translation done.]